What is claimed is:

1. A method of forming a layer of material on a substrate surface using atomic layer deposition (ALD) comprising the steps of:

chemisorbing an alkoxide vapor onto the substrate surface to form an alkoxide layer; and

reacting the alkoxide layer with an activated oxidant that does not include a hydroxyl group to form the layer of material on the substrate surface.

2. A method of forming a layer of material on a substrate surface according to claim 1, wherein the material is an insulating material.

3. A method of forming a layer of material on a substrate surface according to claim 1, wherein the material is selected from a group consisting of HfO_2, ZrO_2, Ta_2O_5, Y_2O_3, Nb_2O_5, TiO_2, CeO_2, In_2O_3, RuO_2, MgO, SrO, B_2O_3, SiO_2, GeO_2, SnO_2, PbO, PbO_2, V_2O_3, La_2O_3, As_2O_5, As_2O_3, Pr_2O_3, Sb_2O_3, Sb_2O_5, CaO and P_2O_5.

4. A method of forming a layer of material on a substrate surface according to claim 1, wherein the alkoxide is a metal alkoxide or a semimetal alkoxide.

5. A method of forming a layer of material on a substrate surface according to claim 4, wherein the alkoxide is at least one metal alkoxide selected from the group consisting of alkoxides of Ti, Zr, Hf, Ge, Sn and Pb.

6. A method of forming a layer of material on a substrate surface

according to claim 1, wherein the alkoxide includes a hafnium alkoxide.

7. A method of forming a layer of material on a substrate surface according to claim 6, wherein the alkoxide includes at least one alkoxide selected from the group consisting of $Hf(OEt)_4$, $Hf(OPr)_3$, $Hf(OBu)_4$, $Hf(OnBu)_4$, $Hf(OtBu)_4$, $Hf(mmp)_4$, $Hf(OtBu)_2(dmae)_2$, $Hf(OtBu)_2(mmp)_2$ and $Hf[OSi(C_2H_5)]_4$.

8. A method of forming a layer of material on a substrate surface according to claim 5, wherein the activated oxidant is at least one oxidant selected from the group consisting of O_3, plasma O_2, remote plasma O_2 and plasma N_2O.

9. A method of forming a second layer of material on a substrate surface according to claim 1, further comprising:

chemisorbing a second alkoxide vapor onto the layer of material on the substrate surface to form a second alkoxide layer; and

reacting the second alkoxide layer with a second activated oxidant that does not include a hydroxyl group to form the second layer of material on the substrate surface.

10. A method of forming a second layer of material on the substrate surface according to claim 9, wherein the alkoxide vapor and the second alkoxide vapor include the same alkoxide.

11. A method of forming a second layer of material on the substrate surface according to claim 9, wherein the alkoxide vapor and the second alkoxide vapor are metal alkoxides including different metals.

12. A method of forming a layer of material on a substrate surface according to claim 1, wherein:

chemisorbing the alkoxide vapor onto the substrate surface to form an alkoxide layer and reacting the alkoxide layer with the activated oxidant to form the layer of material on the substrate surface are conducted at a temperature of between about 100 °C. and about 500 °C.

13. A method of forming a thin film using atomic layer deposition (ALD) comprising, in order:

(a) placing a substrate into a chamber;

(b) introducing a first reactant into the chamber, the first reactant including an alkoxide;

(c) chemisorbing a portion of the first reactant onto the substrate to form an alkoxide layer;

(d) removing a non-chemisorbed portion first reactant from the chamber;

(e) introducing a second reactant into the chamber, the second reactant including an activated oxidant that does not contain a hydroxyl group;

(f) chemically reacting a portion of the second reactant with the alkoxide layer to form a thin film of oxide as an atomic layer on the substrate; and

(g) removing a non-reacted portion of the second reactant from the chamber.

14. A method of forming a thin film using atomic layer deposition (ALD) according to claim 13, wherein the first reactant includes a hafnium alkoxide.

15. A method of forming a thin film using atomic layer deposition (ALD)

according to claim 14, wherein the first reactant is at least one hafnium oxide selected from the group consisting of $Hf(OEt)_4$, $Hf(OPr)_3$, $Hf(OBu)_4$, $Hf(OnBu)_4$, $Hf(OtBu)_4$, $Hf(mmp)_4$, $Hf(OtBu)_2(dmae)_2$, $Hf(OtBu)_2(mmp)_2$ and $Hf[OSi(C_2H_5)]_4$.

16. A method of forming a thin film using atomic layer deposition (ALD) according to claim 13, wherein the second reactant is at least one oxidant selected from the group consisting of O_3, plasma O_2, remote plasma O_2 and plasma N_2O.

17. A method of forming a thin film using atomic layer deposition (ALD) according to claim 13, wherein the steps (b) to (g) are repeated at least once to increase a thickness of the thin film formed on the substrate.

18. A method of forming a thin film using atomic layer deposition (ALD) according to claim 13, wherein the steps (b) to (f) are conducted at a temperature in a range between about 100 °C. to about 500 °C.

19. A method of forming a capacitor for a semiconductor device comprising, in order:

(a) forming a first electrode on a semiconductor substrate;

(b) exposing the first electrode to a first alkoxide;

(c) chemisorbing a first portion of the first alkoxide onto the first electrode to form a first alkoxide layer;

(d) exposing the first alkoxide layer to a first activated oxidant, wherein the first activated oxidant contains no hydroxyl group;

(e) chemically reacting the first alkoxide layer and a portion of the first

activated oxidant to form a dielectric layer on the first electrode; and

(f) forming a second electrode on the dielectric layer.

20. A method of forming a capacitor for a semiconductor device according to claim 19, wherein the dielectric layer includes at least one insulating material selected from the group consisting of HfO_2, ZrO_2, Ta_2O_5, Y_2O_3, Nb_2O_5, TiO_2, CeO_2, In_2O_3, RuO_2, MgO, SrO, B_2O_3, SiO_2, GeO_2, SnO_2, PbO, PbO_2, V_2O_3, La_2O_3, As_2O_5, As_2O_3, Pr_2O_3, Sb_2O_3, Sb_2O_5, CaO and P_2O_5.

21. A method of forming a capacitor for a semiconductor device according to claim 19, wherein the first alkoxide includes a hafnium alkoxide.

22. A method of forming a capacitor for a semiconductor device according to claim 21, wherein the hafnium alkoxide includes at least one alkoxide selected from the group consisting of $Hf(OEt)_4$, $Hf(OPr)_3$, $Hf(OBu)_4$, $Hf(OnBu)_4$, $Hf(OtBu)_4$, $Hf(mmp)_4$, $Hf(OtBu)_2(dmae)_2$, $Hf(OtBu)_2(mmp)_2$ and $Hf[OSi(C_2H_5)]_4$.

23. A method of forming a capacitor for a semiconductor device according to claim 19, further comprising:

(c2) removing a non-chemisorbed portion of the first alkoxide from the first electrode before exposing the first alkoxide layer to the first activated oxidant; and

(e2) removing a non-reacted portion of the first activated oxidant from the first electrode before forming the second electrode.

24. A method of forming a capacitor for a semiconductor device

according to claim 21, wherein the activated oxidant is selected from a group consisting of of O_3, plasma O_2, remote plasma O_2 and plasma N_2O.

25. A method of forming a capacitor for a semiconductor device according to claim 19, wherein steps (b) to (e) are conducted at a temperature between about 100 °C. and about 500 °C.

26. A method of forming a capacitor for a semiconductor device according to claim 19, further comprising:

(b2) exposing the dielectric layer to a second alkoxide;

(c2) chemisorbing a first portion of the second alkoxide onto the dielectric layer to form a second alkoxide layer;

(d2) exposing the second alkoxide layer to a second activated oxidant, wherein the second activated oxidant contains no hydroxyl group; and

(e2) chemically reacting the second alkoxide layer and a portion of the second activated oxidant to form a second dielectric layer on the dielectric layer;

wherein steps (b2) and (e2) are completed before forming the second electrode.

27. A method of forming a capacitor for a semiconductor device according to claim 26, wherein the first alkoxide and the second alkoxide include different metals.

28. A method of forming a capacitor for a semiconductor device according to claim 27, wherein the first alkoxide includes hafnium and the second alkoxide includes aluminum.

29. A method of forming a capacitor for a semiconductor device comprising:

forming a first electrode on a semiconductor substrate;

forming a dielectric layer on the first electrode according to claim 1; and

forming a second electrode on the dielectric layer.